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Nonlinear Alfvén wave interactions in the Large Plasma Device[1]

BRIAN BRUGMAN, TROY CARTER, DAVID AUERBACH, Department of Physics and Astronomy, UCLA — The nonlinear dynamics of large amplitude Alfvén waves are believed to play a major role in the evolution of the macroscopic properties of numerous laboratory plasmas and astrophysical systems. However, despite their importance the nonlinear dynamics of these fluctuations remains a point of great controversy with few prior experimental measurements. Nonlinear interactions between Alfvén waves are being studied [2] in the Large Plasma Device Upgrade (LAPD) at UCLA, using large amplitude, $\delta B/B_0 \sim 1\%$, waves generated by LAPD's Alfvén wave MASER or by antennas. In these experiments the interaction of two co-propagating large amplitude shear Alfvén waves is extensively studied. The nonlinear generation of density fluctuations at the beat frequency along with the formation of numerous discrete Alfvénic sidebands has been observed using both wave launching mechanisms over a broad range of plasma parameters and launch wave frequencies. Detailed measurements of these interactions and comparisons with a nonlinear Braginskii fluid calculation will be presented. Preliminary results from counter-propagating Alfvén wave interaction experiments will also be discussed.

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[2]T.A. Carter, B. Brugman, P. Pribyl and W. Lybarger, Phys. Rev. Lett. 96, 155001 (2006)

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